# Completely Wireless Fencing

## User Guide

v1.2 23/02/26

# CWF User Guide

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## Document History

| Revision | Date | Description |
|---|---|---|
| 1.0 | 14/08/25 | First Issue |
| 1.1 | 11/01/26 | Added Document History section.<br>The Repeater has been discontinued and its function included into the new Repeater Relay. All references to the Repeater have been removed.<br>Changed Plugin construction from solid polycarbonate to a hybrid construction in section 2.1.1.<br>Removed test/coaching mode from section 2.1.2, which is no longer supported in software.<br>Changed Repeater Relay battery from AAA alkaline to Li-Ion in section 2.2.1.<br>Updated the configuration drawings in section 3 to remove the Repeater and show the new Repeater Relay.<br>Added time constraints to the operating instructions in section 4.<br>Added second guard hit instruction to section 4.1.1.<br>Added time constraints to the pairing sequences in section 5. |
| 1.2 | 23/02/26 | Note added to section 1 regarding Plugin serial numbers.<br>Epee auto detection and auto shutdown removed to allow a wider range of epees to be used, including those from Unic.<br>1. Section 2.1 updated.<br>2. Section 4.1.1 updated.<br>3. Section 4.1.2 updated.<br>4. Section 9 updated. |

# CWF User Guide

# 1 Introduction

This document covers the following CWF products:

- Red and green Plugins
- Repeater Relay
- Socketed Plastic Epee
- Integrated Plastic Foil
- Integrated Plastic Epee

This document provides information on the following:

- Product features
- System configurations
- Operating instructions
- Maintenance guidelines
- Troubleshooting guidelines

This version of the User Guide covers Plugins with serial number 1312 and upwards. For earlier serial numbers, please refer to the v1.1 version of the User Guide.

# 2 Product features

## 2.1 Plugin

In normal fencing, the Plugins are used in pairs. One is assigned red and the other green. Optionally, they can be used with the Repeater Relay.

Two pairs of Plugins can be used in team fencing. Two are assigned red and two green. Optionally, they can used with the Repeater Relay.

The Plugin can be used with a standard metal epee or the Socketed Plastic Epee from CWF.

### 2.1.1 Plugin features common to metal and plastic epees

Here are some of the features of the Plugin that are the same when used with either metal or plastic epees.

**Inserts directly into the epee.** This removes the need for a body wire, which reduces the amount/cost of personal and club kit.

**Plugins communicate directly with each other to determine and display the hit result.** This removes the need for a separate display unit, which significantly reduces the cost of wireless fencing and allows pistes to be placed closer together. In traditional wired and other wireless scoring systems, the display unit determines the timing of hits and awards the result to either the red or green fencer, or to both for double hits. Since our system can comprise only two Plugins, the role of the display unit is adopted by the red Plugin. For this reason, both Plugins must be switched on and inserted into epees for the correct result to be displayed on both Plugins (and Repeater Relay if it is being used).

**Contains red and green LEDs plus a buzzer.** Results are displayed simultaneously on both Plugins for each fencer to view.

**Meets all FIE timings.** A pair of Plugins are compliant with the FIE Material Rules (October 2024) for epee timings.

**Long battery life.** The Plugin will last over 10 hours or over 2500 hits on a single charge, whichever comes first. The battery charge status is displayed when the Plugin is switched on. The green LED indicates the battery has between 3 hours and 10 hours remaining use. The red LED indicates the battery has less then 3 hours remaining. These figures are only approximate and should not be relied upon.

**Automatically switches off.** The Plugin automatically switches off after four minutes without a hit.

**Fast charging.** The Plugin will fully charge in two hours using a standard USB-C cable. USB-C cable and power supply are not included.

**Compact and lightweight.** The Plugin measures 60mm x 46mm x 15mm (not including the pins) and weighs 45g.

**Robust case.** The case combines a 3D printed core with two outer polycarbonate plates, providing a tough exterior capable of withstanding multiple direct hits.

**Spare pins.** Although the pins will eventually wear or break after repeated use, they are easy to replace with a standard cross-head screwdriver. Our sets come with three spare pins and they are also available separately.

### 2.1.2 Plugin features for metal epees only

Here are the features of the Plugin that are unique when used with metal epees.

**Detects some epee faults.** On insertion, the Plugin checks for short circuits between either of the blade wires and the metalwork.

**Simple plug and play.** A single hit to the opponents guard is required to calibrate the Plugin.

**Detects hits to different target areas.** Body hits result in either the red or green LEDs illuminating and the buzzer sounding. Hits to the opponents guard or conductive piste do not register. Hits to an unpainted part of the mask may be seen as a guard hit and therefore may not register.

### 2.1.3 Plugin features for plastic epees only

Here are the features of the Plugin that are unique when used with plastic epees.

**Manual selection required.** A plastic epee can't be automatically detected so must be selected by pressing the tip switch for three seconds after inserting into the sword.

**Guard and piste hits.** Hits to any object will register a hit.

## 2.2 Repeater Relay

The Repeater Relay can either be hand held or connected to an existing scoring box. The scoring box must be set to epee mode and has no involvement in determining the hit result.

The Repeater Relay can either be used with the Plugins or the Integrated plastic swords (foil or epee).

### 2.2.1 Repeater Relay features common to both

**Simple connection.** Connects to the scoring box using either existing ground cables, body wires or 1m cables available from CWF.

**Compatibility.** The Repeater Relay operates with all existing scoring boxes set to epee.

**Automatically switches off.** The Repeater Relay will automatically switch off 10 minutes after the last hit.

**Long battery life.** The Repeater Relay will last over 10 hours or over 2500 hits on a single charge, whichever comes first. The battery charge status is displayed when the Repeater Relay is switched on. The green LED indicates the battery has between 3 hours and 10 hours remaining use. The red LED indicates the battery has less then 3 hours remaining. These figures are only approximate and should not be relied upon.

**Fast charging.** The Repeater Relay will fully charge in two hours using a standard USB-C cable. USB-C cable and power supply are not included.

### 2.2.2 Repeater Relay features for Plugins only

Here are the features of the Repeater Relay that are unique when used with Plugins.

**Displays the same hit result as the Plugins.** The red Plugin determines the hit result and then sends it to the green Plugin and Repeater Relay. The Repeater Relay has no involvement in determining the hit result.

### 2.2.3 Repeater Relay features for Integrated swords only

Here are the features of the Repeater Relay that are unique when used with Integrated Plastic Foils and Integrated Plastic Epees.

**Determines the hit result.** The Repeater Relay determines the hit result after receiving information from the Integrated plastic swords.

## 2.3 Plastic Swords

Two variants of plastic sword are available, either Socketed or Integrated.

### 2.3.1 Features common to both plastic swords.

**Made from durable plastic.** The blade has a good balance of flexibility allowing good point control, whilst being safe.

**Unique tip switch.** Other electric plastic swords available use a commercial off the shelf switch placed in the tip of the blade and then covered with a rubber boot. These switches are not intended to be used in high impact environments and therefore have high failures rates. The tip switch in our swords has been designed and developed to be robust and reliable. They will operate for over 250,000 hits under normal fencing conditions.

**Solid tip.** Other plastic swords have a rubber boot, which is prone to tearing particularly after floor hits. The

tip in our swords is made from hard plastic, which is very durable, but 20mm wide and curved to minimise impact forces.

**Ambidextrous handle.** The swords can be used by right and left handed fencers.

**Easy maintenance.** Replacement tips, blade wire and guards are available and are easy to fit. Section 8.2.1 describes the construction in more detail.

### 2.3.2 Socketed plastic sword features

**Standard epee connector.** This allows either Plugins or body wires to be inserted, so you have the choice or going wireless or staying wired.

### 2.3.3 Integrated plastic sword features

**Wireless electronics.** The wireless PCB is placed inside the handle and communicates directly with the Repeater Relay.

**Foil and epee options.** Available with either foil or epee guard. The remainder of the sword is identical.

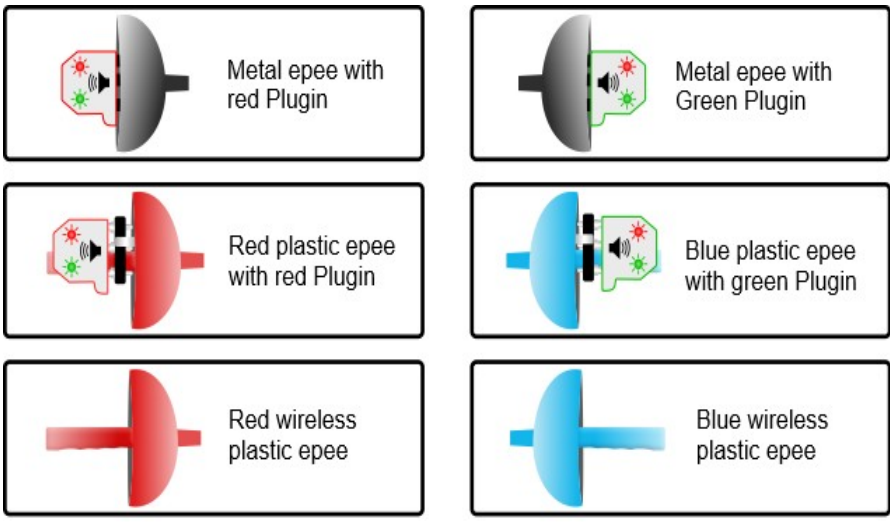
**Long battery life.** The two SR48 coincell batteries will last 500K+ hits or more than 2 years of intense fencing. The batteries are easy to replace.

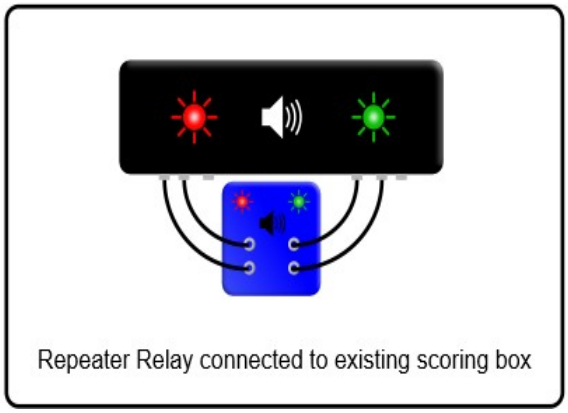
# 3 Configurations

Plugins, Repeater Relays and plastic swords can be used in many different configurations depending on your needs. This section illustrates the majority of most commonly used configurations.

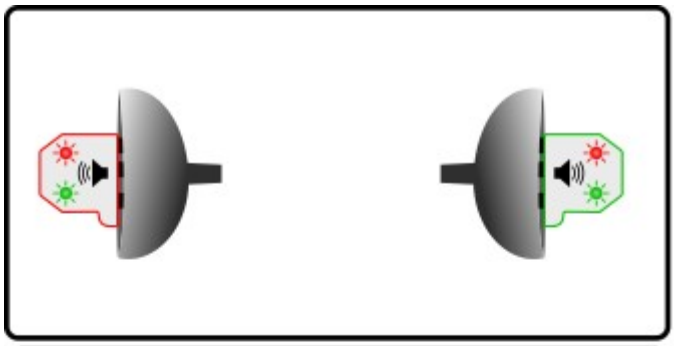
## 3.1 Symbols

The following symbols are used to show the various parts of the system and how they connect together.



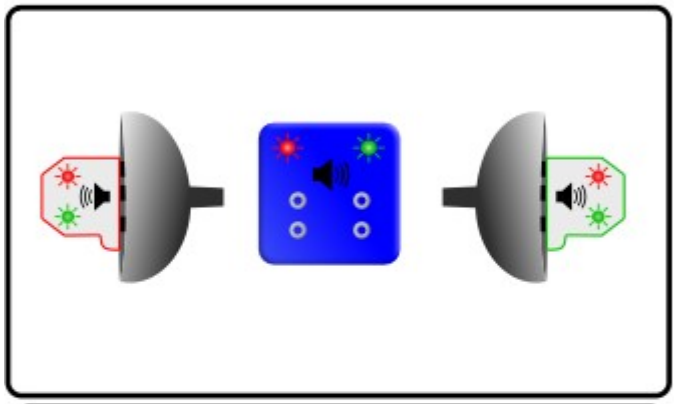



## 3.2 Fencing with Plugins and metal epees



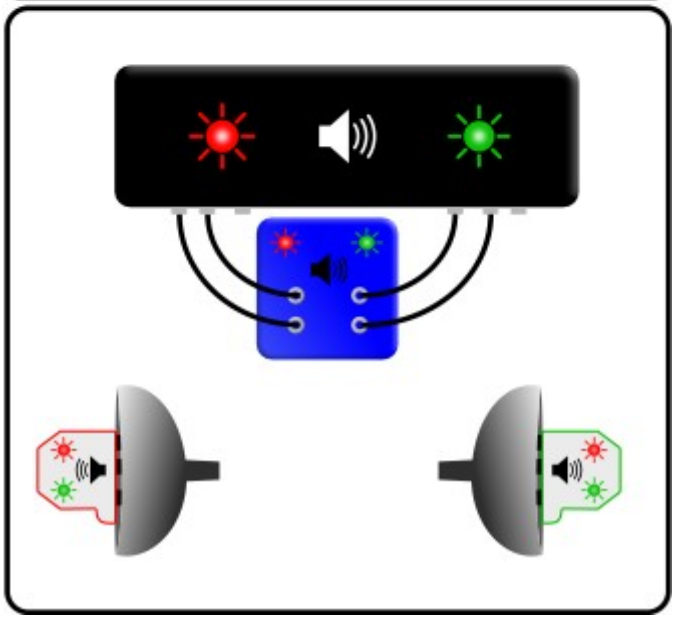
**Two Plugins**

This is the simplest and cheapest configuration but is also ideal if you are limited with space and don't have a referee or spectators.



**Two Plugins and one Repeater Relay**

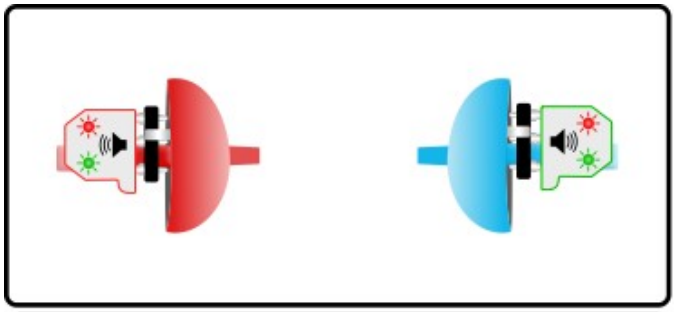
This is the simplest configuration when you need to referee or coach from the side of the piste. The Repeater Relay is handheld, allowing you to move with the fencers.



**Two Plugins, one Repeater Relay and an existing scoring box**

This is an ideal configuration if you have existing scoring boxes and just want to remove the spools, ground wires and body wires.

## 3.3 Configurations with Plugins and Socketed plastic epees



**Two Plugins**

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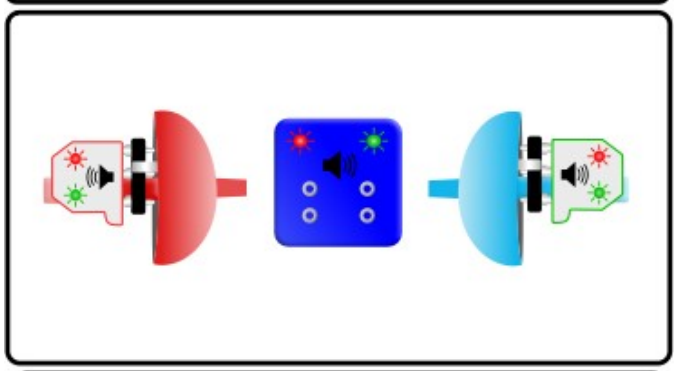
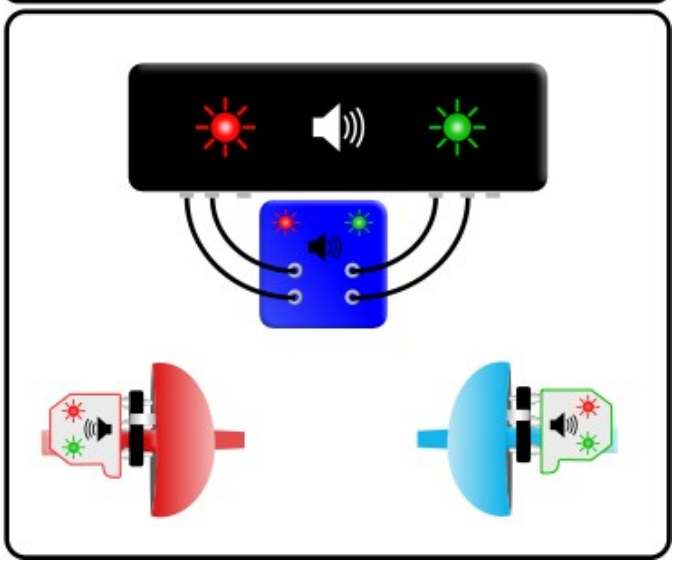


**Two Plugins and one Repeater Relay**

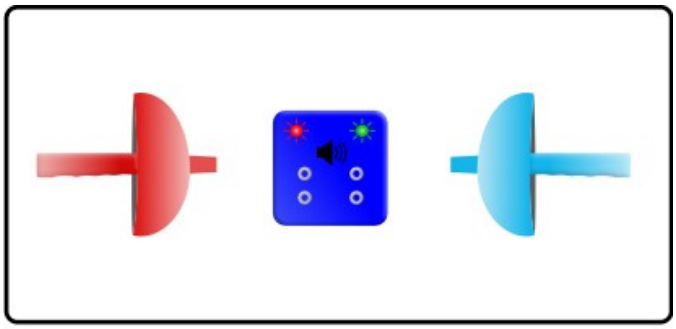
This is the simplest configuration when you need to referee or coach from the side of the piste. The Repeater Relay is handheld, allowing you to move with the fencers.



**Two Plugins, one Repeater Relay and an existing scoring box**

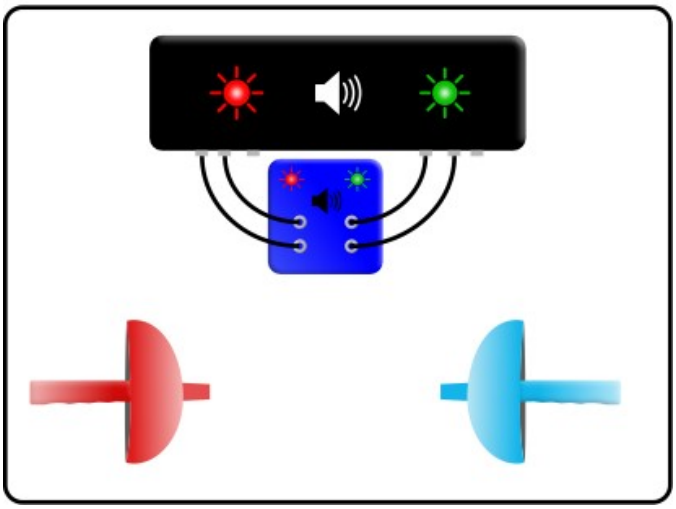
This is an ideal configuration if you have existing scoring boxes and just want to remove the spools, ground wires and body wires.

## 3.4 Configurations with Integrated plastic swords



**One Repeater Relay**

This is the simplest configuration. The Repeater Relay can be hand held by one of the fencers, coach or referee.



**One Repeater Relay and an existing scoring box**

This is an ideal configuration if you have existing scoring boxes and just want to remove the spools, ground wires and body wires.

## 3.5 Team epee fencing

Simply add another pair of Plugins or Integrated plastic swords to any of the configurations to enjoy team fencing. Follow the instructions in the sections 5.4 and 5.5 to pair all the units and then follow the recommendations in the section 7 .

# 4 Operating Instructions

## 4.1 Plugin

The Plugin Quickstart Guide provides a flowchart which will help to understand the following instructions. Please have a look at it before proceeding. If any of these instructions fail, then refer to the Plugin Quickstart Guide for help.

### 4.1.1 Plugins with metal epees

1) Briefly press the switch located between the Plugin pins.
2) Either the red or green LED will flash and the buzzer sound. A red LED indicates the battery is running low and requires charging. A green LED indicates there is sufficient charge for at least 3 hours of use.
3) Insert the Plugin into the epee.
4) There should be no reaction from the Plugin. If an LED flashes and the buzzer sounds there has been a problem. Remove the Plugin and start with instruction 1) again.
5) Wait for your opponent to complete steps 1-4.
6) Hit your opponents guard without touching their epee with your hand. The red or green LED should briefly flash and the buzzer sound. This first guard hit calibrates the guard detection software. If there is no reaction from the Plugin, there could be a fault with the epee. Remove the Plugin and start with instruction 1) again.
7) Hit your opponents guard for the second time. There should be no response, indicating the guard detection software is working correctly. If either LED flashes and the buzzer sounds, remove the Plugin and start with instruction 1) again.
8) Wait for your opponent to complete steps 6-7.
9) Perform one last foot hit to confirm the Plugin and epee are working correctly.
10) You are now ready to fence. When you have finished, simply remove the Plugin from the epee.

### 4.1.2 Plugins with Socketed plastic epees

1) Briefly press the switch located between the Plugin pins.
2) Either the red or green LED will flash and the buzzer sound. A red LED indicates the battery is running low and requires charging. A green LED indicates there is sufficient charge for at least 3 hours of use.
3) Insert the Plugin into the epee.
4) Press and hold the tip switch until one of the LEDs flash and the buzzer sounds. If neither LED flashes within three seconds, remove the Plugin and start with instruction 1) again.
5) Wait for your opponent to complete steps 1-4.
6) You are now ready to fence. When you have finished, simply remove the Plugin from the epee.

## 4.2 Repeater Relay

When used with the Plugins, the Repeater Relay and scoring box displays the same result as the both of the Plugins. Follow the instructions in section 5.2 to pair the Repeater Relay to the red Plugin.

When used with Integrated plastic swords the Repeater Relay determines the hit result and displays it on the internal LEDs and the scoring box. Follow the instructions in section 5.3 to pair the Repeater Relay to the red

and green Integrated plastic swords.

1) Briefly press the button on the Repeater Relay. The white LED should come on.
2) Either the red or green LED will flash and the buzzer sound. A red LED indicates the battery is running low and requires charging. A green LED indicates there is sufficient charge for at least 3 hours of use.
3) When used with Integrated plastic swords, the double hit timing can be flipped between foil and epee by briefly pressing the button. The red or green LED will flash. Green indicates epee timing and red indicates foil timing.
4) When you have finished, press and hold the button until the red LED turns on. Release the button and a few seconds later the red LED will turn off.

# 5 Pairing

Wireless scoring systems from CWF must have one unit configured as the Controller and one or more units configured as Peripherals. The Controller decides on the hit awarded and then sends the result to each of the Peripherals.

For configurations using Plugins, the red Plugin is always the Controller and the remaining Plugins and Repeater Relay are all Peripherals.

For configurations using Integrated plastic swords, the Repeater Relay is the Controller, and the swords are always Peripherals.

The Controller initiates the pairing process and each Peripheral responds to complete the process.

A full list of the different configurations can be found in the Configurations section.

Many of the steps listed below must be completed within a few seconds of each other, otherwise the units will switch off and the sequence will need to be repeated. Try each of the sequences several times, whilst you get familiar with each step. You can't do any damage to the units, since they will simply switch off if the next step isn't completed within the given time frame.

## 5.1 Plugin to Plugin

1) Briefly press the button on both Plugins at the same time.
2) Within two seconds, press and hold the button on the red Plugin until the red LED comes on and then release the button.
3) Within two seconds, briefly press the button on the green Plugin.
4) The red and green LEDs on the red Plugin should flash and the buzzer sound.
5) The green LED on the green Plugin should flash and the buzzer sound.
6) Both Plugins will switch off after pairing.

## 5.2 Plugin to Repeater Relay

1) Briefly press the button on the Repeater Relay and confirm the white LED is on.
2) Briefly press the button on the red Plugin.
3) Press and hold the button on the red Plugin until the red LED comes on and then release the button.
4) Within two seconds, briefly press the button on the Repeater Relay.
5) The red and green LEDs on the Controller Plugin should flash and the buzzer sound.
6) The green LED on the Repeater Relay should flash.
7) The Plugin and Repeater Relay will switch off after pairing.

## 5.3 Repeater Relay to Integrated Plastic Sword

1) Briefly press the button on the Repeater Relay and confirm the white LED is on.
2) Press and hold the button on the Repeater Relay until the red LED turns on and then release the button.
3) Press the tip switch on the red sword for one second.
4) The red LED should turn off and the green LED should turn on briefly. If this doesn't happen press the tip switch again.
5) After a couple of seconds the green LED should turn off and the red LED turn on.
6) Press the tip switch on the blue sword for one second.
7) The red LED should turn off and the green LED should turn on briefly. If this doesn't happen press the tip switch again.
8) The red should turn off and the green should turn on briefly.
9) The Repeater Relay will switch off after pairing.

## 5.4 Team fencing with Plugins

If you have two sets of Plugins then why not have a go at team fencing. Simply pair the second set to the first set and then follow the basic rules in section 7 . The red Plugin from set #1 will be the controller. The green Plugin from set #1 and both Plugins from set #2 will be peripherals.

1) Follow steps 1-6 in section 5.1 to pair the red Plugin from set #2 to the red Plugin from set #1.
2) Follow steps 1-6 in section 5.1 to pair the green Plugin from set #2 to the red Plugin from set #1.

When you have finished team fencing then just pair set #2 following steps 1-6 in section 5.1 .

## 5.5 Team fencing with Integrated plastic swords

If you have two sets of Integrated plastic swords then why not have a go at team fencing. Simply pair the second set of swords to the Repeater Relay and then follow the basic rules in section 7 . Follow steps 1-9 in 5.3 to pair the second set of swords to the Repeater Relay.

When you have finished team fencing then just pair the second set of swords to another Repeater Relay following steps 1-9 in section 5.3 .

# 6 Battery Charging

None of the CWF products are supplied with a USB charger or cable since these are universally available and most people already have them at hand. However, if you have multiple products containing rechargeable batteries and wish to charge them all at the same time for convenience, then two, three and four way splitter cables are readily available on-line. A two way splitter cable will allow you to charge two Plugins from a single USB power supply. A three way splitter cable will allow you to charge two Plugins and a Repeater Relay from a single USB power supply.

*Single type A to three type C USB splitter cable*

## 6.1 Plugin charging

1) Switch on the USB power source
2) Insert the USB cable into the Plugin.
3) To confirm the Plugin is charging, briefly press the black button. The red LED will flash five times to indicate the battery is charging. Charging takes up 2 hours depending on the initial state of charge.

## 6.2 Repeater Relay charging

1) Switch on the USB power source
2) Insert the USB cable into the Repeater Relay.
3) To confirm the Repeater Relay is charging, briefly press the button. The red LED will flash five times to indicate the battery is charging. Charging takes up 2 hours depending on the initial state of charge.

# 7 Team Fencing

An exciting feature of the Plugins and Integrated plastic swords is that multiple sets can be linked, allowing for two teams to compete against each other, with all team members fencing at the same time. This is different to traditional team fencing, where the fights are done sequentially.

## 7.1 Team fencing with metal epees

There is no physical limit to the number of Plugins that can be paired together, but for safety we recommend two teams of two fencers for metal fencing. An emphasis must be placed on safety, particularly team mates staying close together when fencing with metal swords to reduce the risk of being hit to the rear of the head. To aid this, movement is restricted to a much smaller area. Follow the instructions in sections 5.4 to pair two sets of Plugins.

This guide provides some basic rules for team epee fencing. These can be adapted to your own needs but we recommend completing a risk assessment before proceeding.

1) Two red fencers fence two green fencers.
2) Each fencer can hit either of their opponents, including diagonally.
3) Fencing is restricted to an area 5m x 2m for safety (the area between en-guard lines is ideal).
4) A yellow card is awarded against any fencer that steps over their back line.
5) A yellow card is awarded against any fencer that fleches.
6) Normal rules regarding yellow and red cards apply.
7) Team mates are allowed to swap places once for a poule fight, and three times for a DE fight.
8) The first team to swap is allowed. The other team must not swap until the next point.
9) Up to 10 seconds are allowed between hits for team mates to confer.

## 7.2 Team fencing with plastic swords

There is no physical limit to the number of Plugins or Integrated plastic swords that can be paired together, but for safety we recommend two teams of either two or three fencers for plastic fencing. Follow the instructions in sections 5.4 and 5.5 to pair multiple sets.

This guide provides some basic rules for team epee fencing. These can be adapted to your own needs but we recommend completing a risk assessment before proceeding.

1) Two or three red fencers fence two or three green fencers.
2) Restrict the combat area, a badminton court is ideal for six fencers.
3) The two teams must face each other to start with, but each fencer can move freely around the space and where possible get behind their opponents.
4) Each fencer can hit any of their opponents.
5) Fencers that are hit are removed from the fight until one team is eliminated.

# 8 Maintenance

## 8.1 Plugin

The three Plugin 4mm pins can suffer from damage and wear and therefore they have been designed to be easily replaced. Each CWES comes with 3 spare pins and more are available via our website.

### 8.1.1 Pin Replacement

1) Remove the M3 screw from the rear of the pin.
2) Slide the old pin out.
3) Insert the new pin and secure with the M3 screw.

## 8.2 Plastic Swords

There are two versions of the plastic sword, Socketed and Integrated. The Socketed version comes with a standard epee socket, which can be used with the CWE Plugins and traditional body wires. The Integrated version has the electronics embedded inside the handle and communicates wirelessly with the CWE Repeater Relay.

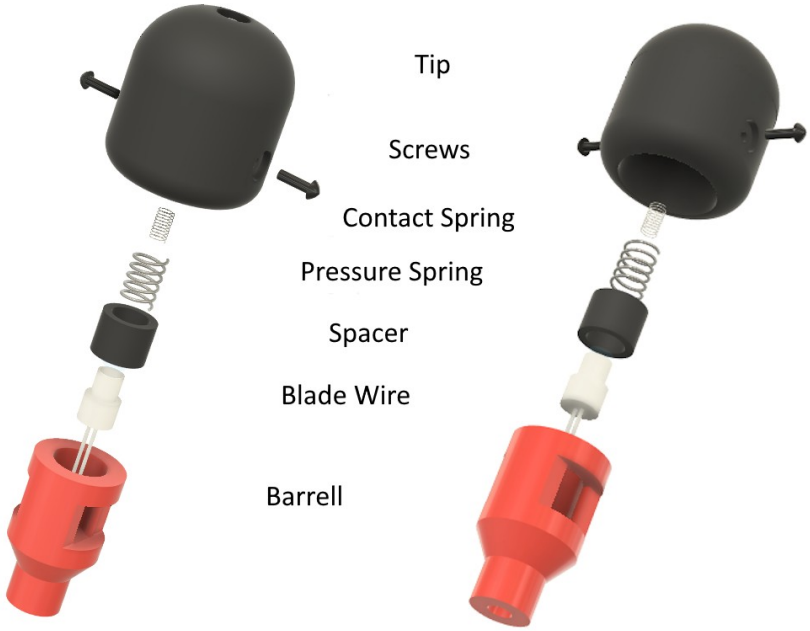
The two versions of the plastic sword share the same unique tip switch and blade.

Please note that several swords were used during the writing of these instructions and therefore the sword colour may change from one photo to another.

It is much easier to complete some of the following steps, if the blade is held vertically or horizontally in a bench vice.

### 8.2.1 Tip Switch Construction

The following picture shows an exploded view of the tip switch assembly. As you can see it has a similar construction to a metal epee tip switch, which is one of the reasons why it is robust, easy to repair and maintain.




The barrel is part of the plastic blade. The blade wire (two copper wires attached to a plastic housing) fits inside the barrel with the wires running down the blades hollow core. A spacer is required inside the barrel, since the blade wire housing is designed to fit a much narrower barrel found on a metal epee. The pressure spring slots in between the housing and spacer. The contact spring fits over a machine screw located inside the tip. Two self tapping screws hold the tip in place and limit the travel of the tip over the barrel, the same as grub screws on a metal epee.

### 8.2.2 Tip Replacement

On the rare occasion that the tip needs replacing, follow these instructions.

1) Press down the tip and remove the two selfing tapping screws.

2) Remove the tip from the barrel.

3) Position the new tip over the barrel so that the screws align with the holes in the side of the barrel.
4) Press down the tip and tighten the two screws.
5) Check the tip moves freely when pressed.

## 8.2.3 Integrated Plastic Sword Blade Wire Replacement

On the rare occasion that the blade wire needs replacing, follow these instructions.

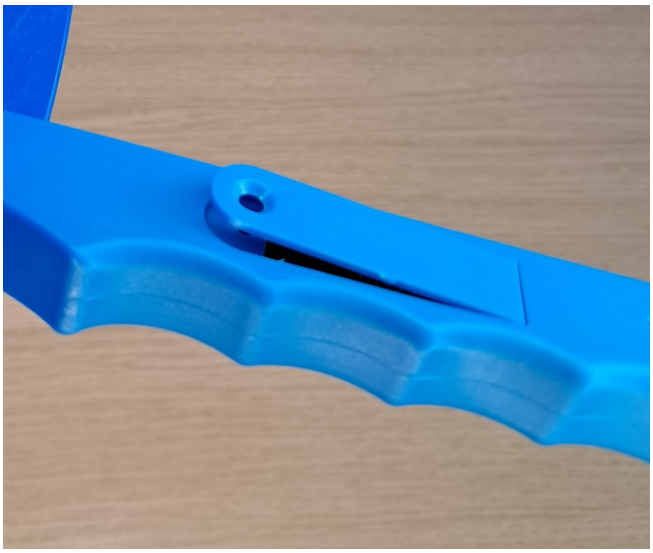
### 8.2.3.1 Equipment Required

- Small cross head screwdriver.
- Small pliers or tweezers
- Sharp knife

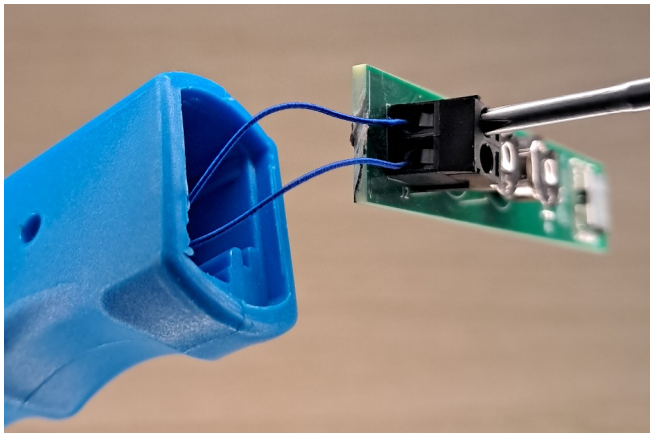
### 8.2.3.2 PCB Removal

1) Using the screwdriver prise off the plate at the end of the handle.

2) Remove the screw and side panel.



3) Slide the PCB out of the handle and unscrew the blade wires from terminal block.



#### 8.2.3.3 Blade Wire Removal

6) Press down the tip and remove the two selfing tapping screws.

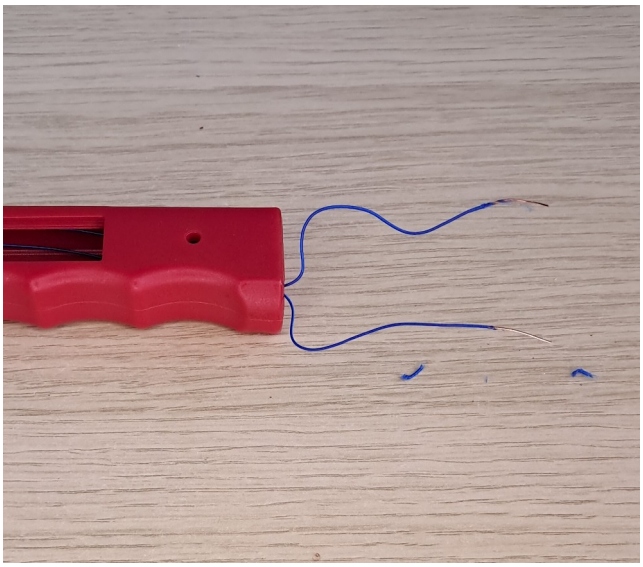
7) Remove the tip from the barrel and keep it safe.

8) Remove the pressure spring and keep it safe.
9) Remove the blade wire from the blade.
10) Remove the spacer from the blade wire housing and keep safe.

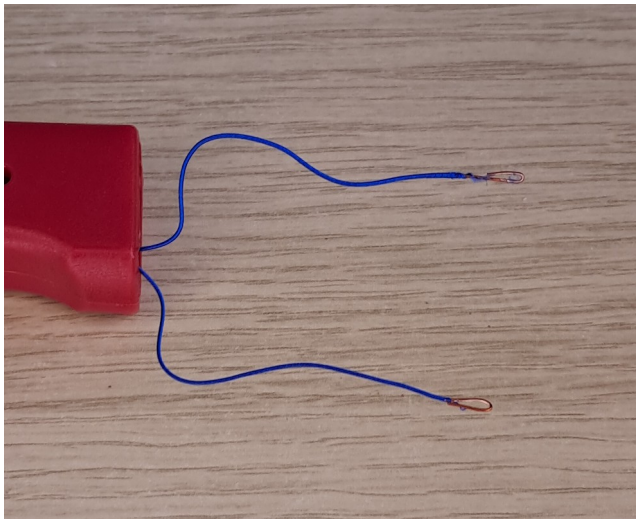
### 8.2.3.4 Blade Wire Fitting

1) Fit the spacer to the blade wire housing.
2) Feed the new blade wire into the end of the blade and then push the blade wire housing into the barrel using your finger.
3) Using a screwdriver, push the blade wire housing housing until it is fully seated. Repeat for the spacer. It is important that they are fully seated without damaging either part.

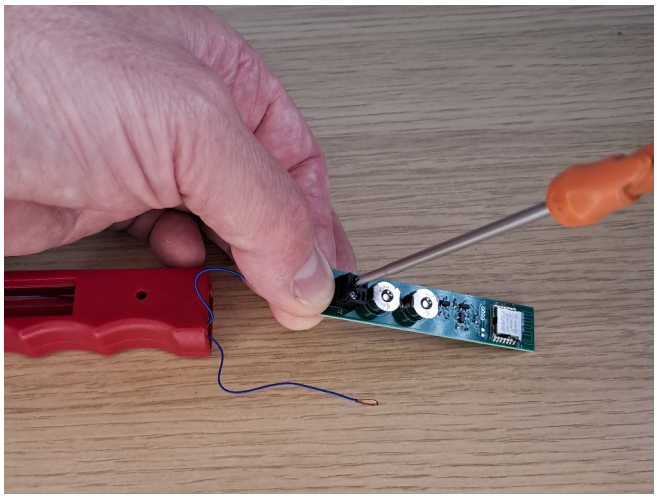
4) Refit the pressure spring and tip.
5) Cut the blade wire so there is 6 cm protruding from the end of the handle.
6) Using a sharp knife scrape off 1 cm of of the outer insulation and enamel from each wire to expose the bare copper.



7) Fold over the end of each wire.



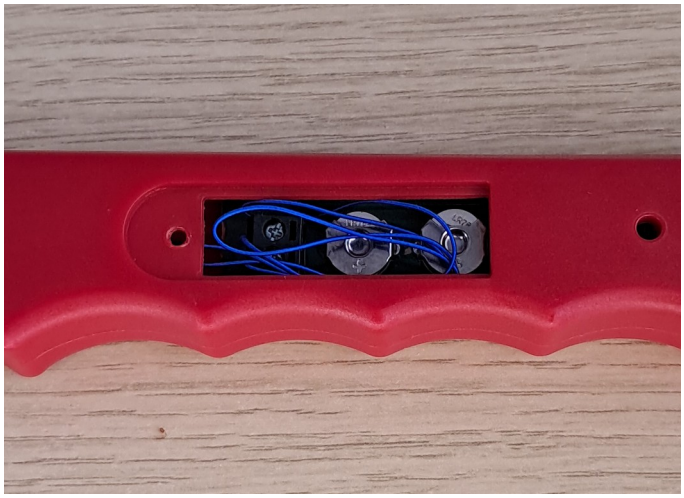
8) Screw each wire into the terminal block of the PCB.



9) Slide the PCB into the handle whilst pulling the excess wire through the side panel on the side.

10) Refit the end plate.

11) Fold the excess wire within the area of the side panel. It is important not to push it down to the end of the handle, since the metal wire may interfere with the RF antenna at the end of the PCB.



12) Refit the side panel.

## 8.2.4 Socketed Plastic Sword Blade Wire Replacement

On the rare occasion that the blade wire needs replacing, follow these instructions.

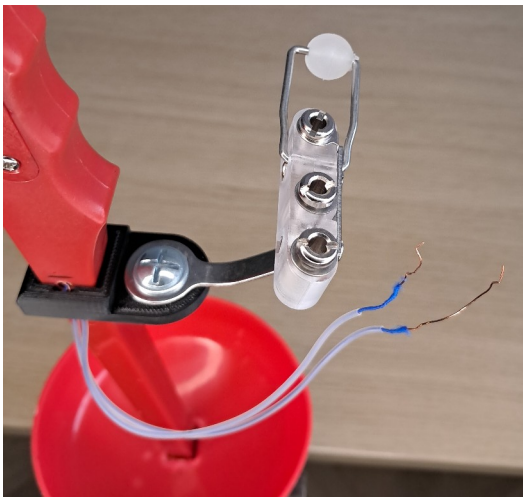
### 8.2.4.1 Equipment Required

- Small cross head screwdriver.
- Small pliers or tweezers
- Sharp knife

### 8.2.4.2 Socket Removal

1) Push the guard down the blade to give access to the socket bracket.

2) Unscrew the blade wires from the socket and extract them.



3) Slide the bracket down the blade and remove the clear sleeving from the wires.

#### 8.2.4.3 Blade Wire Removal

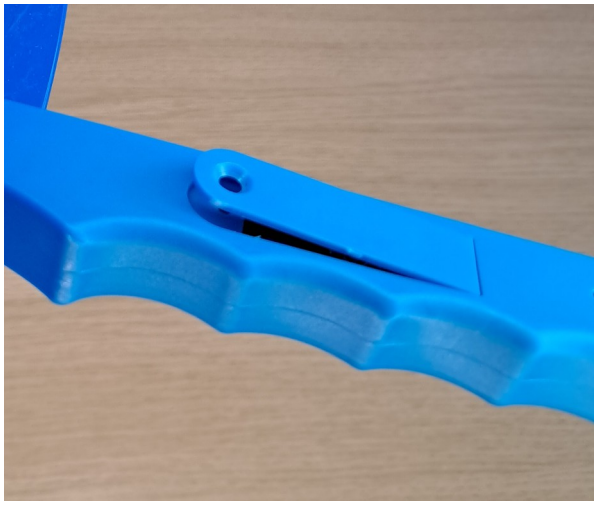
1) Press down the tip and remove the two selfing tapping screws.

2) Remove the tip from the barrel and keep it safe.

3) Remove the pressure spring and keep it safe.
4) Remove the blade wire from the blade.
5) Remove the spacer from the blade wire housing and keep safe.

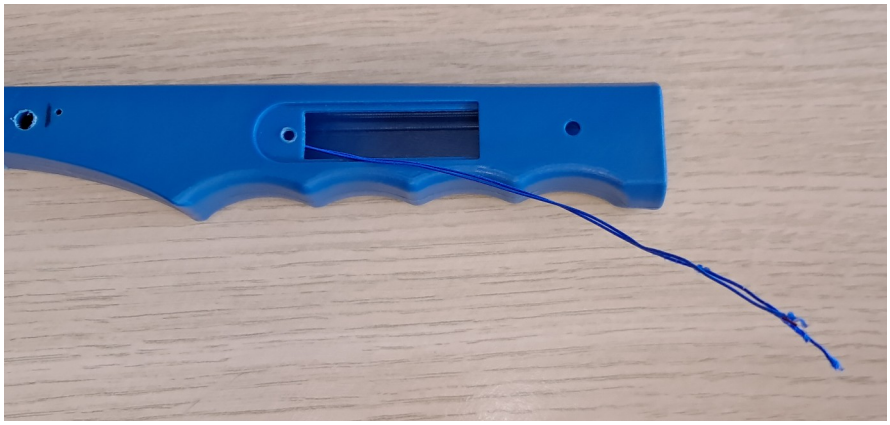
#### 8.2.4.4 Blade Wire Fitting

1) Remove the side panel.

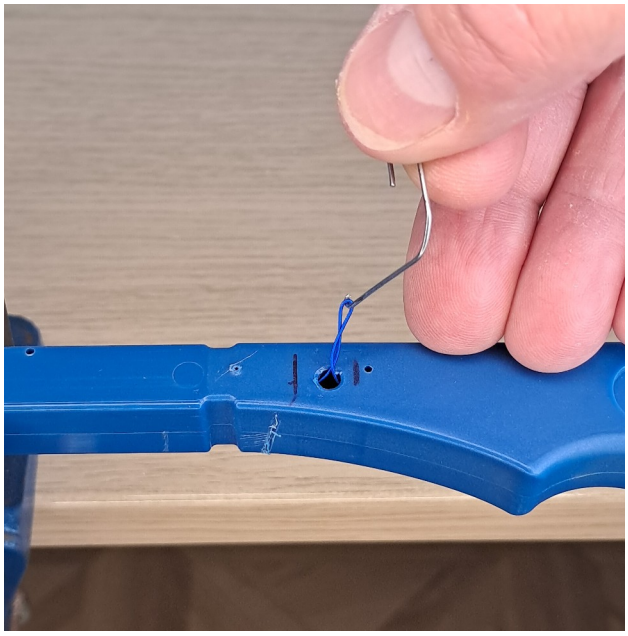


2) Feed the new blade wire into the end of the blade until there is 5cm protruding. Refit the spacer to the blade wire housing.

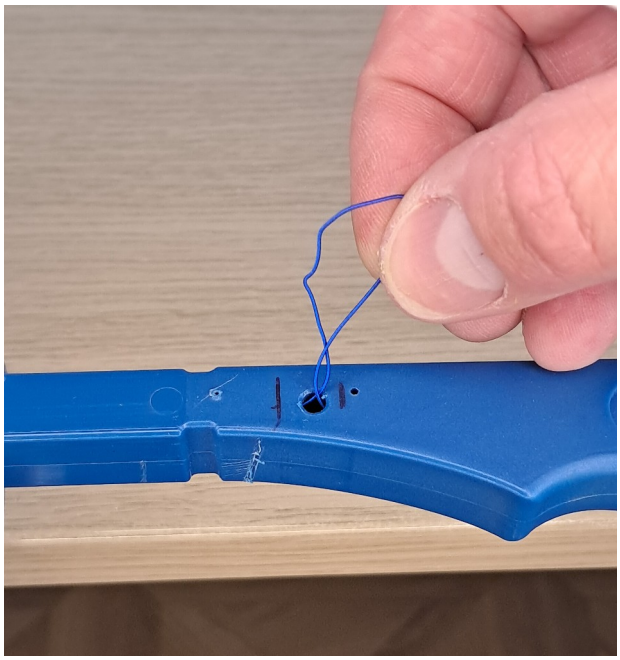
3) Feed out the excess wires through the side panel.



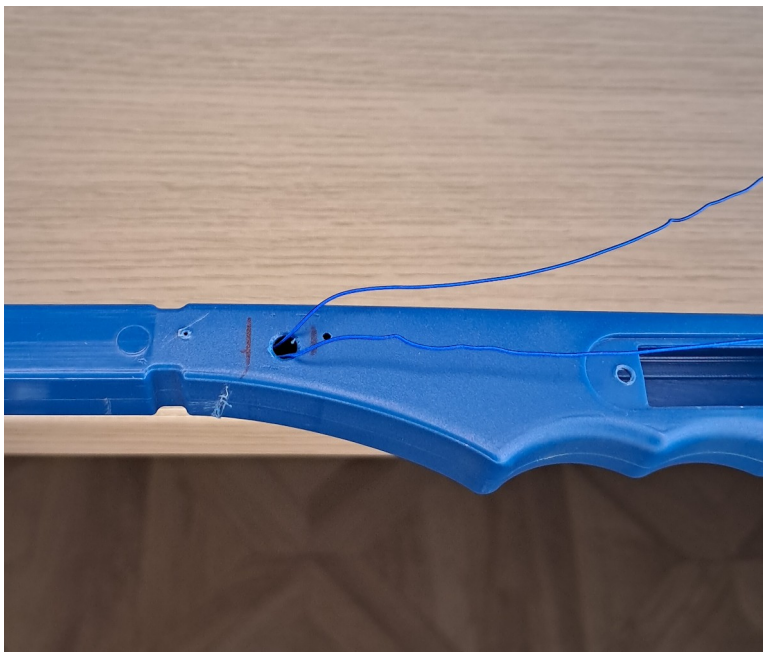
4) Using the tool that comes with the blade wire, fish out the first wire through the small hole in the side of the blade. It may help to move the wires in the side panel to position them below the hole. Having excess wire at both ends of the blade, makes it much easier to pull the wire through the hole.



5) Once a few centimetres are protruding, use your fingers to ease each wire through the hole. Be careful to ensure no kinks form in the wire.



6) Repeat for the second wire.



7) Pull both wires to remove the excess at the barrel end.
8) Push the blade wire housing and spacer into the barrel using your finger.

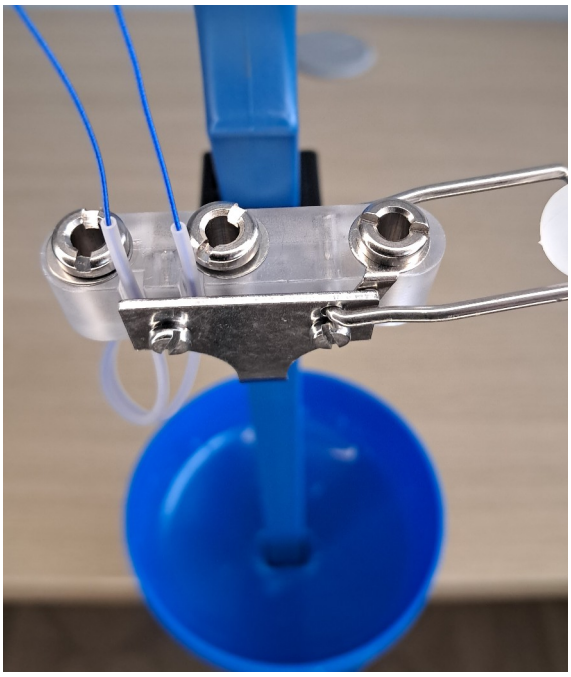
9) Using a screwdriver, push the blade wire housing housing until it is fully seated. Repeat for the spacer. It is important that they are fully seated without damaging either part.

10) Place the guard and bracket over the blade ensuring correct orientation but do not push into place.
11) Refit the pressure spring and tip.
12) Push the excess wire into the handle so there is 18cm remaining.
13) Refit the clear sleeving over each wire.
14) Bend the wires over ensuring the sleeving is pushed part way into the hole.

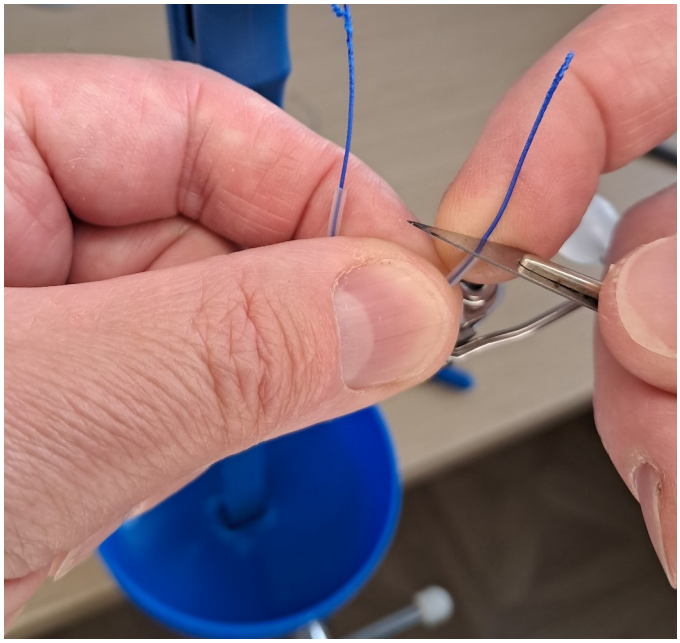
15) Slide the bracket towards the handle ensuring the two wires pass between the blade and bracket and are within the small channel on the inside of the bracket.

16) Push the bracket up towards the handle until it fully covers the hole.

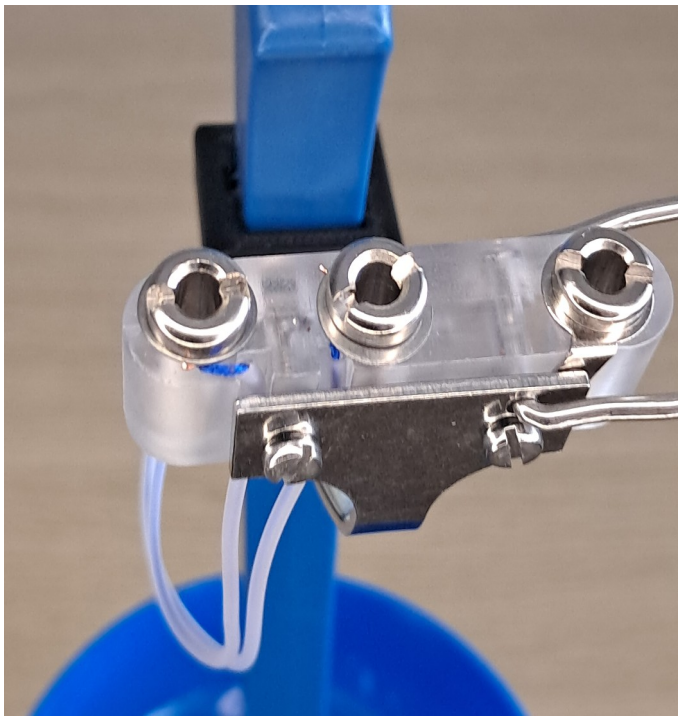
17) Feed the ends of each wire through the channels in the socket.



18) Trim the wires to 2 cm from the end of the sleeving.
19) Using a sharp knife, scrape off the outer insulation and then the enamel from each wire to expose bare copper.



20) Position the bare wire under the washer and using a pair of pliers, wrap the wire around the terminal in a clockwise direction. Tighten the terminal. Repeat for the other wire.



21) Push the guard into position so that it clamps the bracket.

22) Refit the side panel.

# 9 Troubleshooting

Wireless systems use a completely different method of detecting on-target and off-target hits to a traditional wired system. To maximise performance, equipment must be maintained to a higher standard than required for a wired system. We highly recommend checking your epee with the CWF Advanced Epee Analyser or Digital Multimeter (DMM) at the start of each session.

This section covers some of the more common problems you may encounter and provides a number of solutions for each. If you find your problem persists or is not on the list, then please get in contact with us and we will try our best to resolve it.

The connector on the epee comprises three 4mm sockets. Sockets 1 and 2 connect to two wires which run down the length of the blade to the tip switch. Socket 3 attaches the connector to the bracket, which in turn is clamped between the handle and guard.

## 9.1 Plugins with metal epees

Please follow all the instructions in the Plugin Quickstart Guide before proceeding.

**Problem 1. The Plugin red LED flashes and the buzzer sounds when I press the switch (box 1 in the Plugin Quickstart Guide).**

The red LED indicates the battery is running low and that there is less than 3 hours use remaining. Please follow the battery charging instructions in section 6 .

**Problem 2. The Plugin LEDs do not flash and the buzzer does not sound when I press the switch (box 2 in the Plugin Quickstart Guide).**

This is due to the Plugin battery being completely empty. Please follow the battery charging instructions in section 6 .

**Problem 3. The Plugin LEDs flash and the buzzer sounds when it is inserted into an epee (box 3 in the Plugin Quickstart Guide).**

When the switch is briefly pressed, the Plugin enters calibration mode. When it is inserted into the epee, it performs some checks on the epee, including short circuits between the blade wires and the blade.

**Solution 1:** If the LED flash only occurs once, remove the Plugin and start again.

**Solution 2:** If the LED flashing is continuous, remove the Plugin and check the epee for short circuits between pins 1 and 3, and pins 2 and 3 on the epee socket.

**Problem 4. The Plugin LEDs do not flash and the buzzer does not sound when my opponents guard is hit for the first time (box 4 in the Plugin Quickstart Guide).**

The first guard hit calibrates the Plugin and should be acknowledged by the Plugin. Repeat a few more times.

**Solution 1:** Check the epee handle is not loose on both epees. Any small movement of the handle can cause a poor connection (several 10s of ohms) between the epee handle, guard and Plugin.

**Solution 2:** Check the epee connector is not loose on the bracket.

**Solution 3:** Check the two wires at the epee connector for breaks or loose terminal sockets.

**Solution 4:** After repeated insertions, the Plugin pins can wear causing poor contact between the Plugin pin and epee connector socket. Use the spare socket provided on the side of each CWES case to check each pin for wear. If the Plugin pin feels loose when inserted, it can be adjusted using a small flat bladed screwdriver. Each Plugin pin has four spring fingers running the length of the pin. Using a small flat bladed screwdriver, gently open the spring by a fraction of a millimetre.

**Solution 5:** After repeated insertions, the Plugin pins can break causing poor contact between the Plugin pin and epee connector socket. Visually check each pin for broken spring fingers, which run from the pin tip to the pin base. If any pins are broken replace them with with spares, which are provided in each set. Follow the Plugin pin replacement instructions in section 8.1.1 .

**Solution 6:** Replace the contact spring.

**Solution 7:** Check the wiring from inside the barrel to the connector sockets.

**Solution 8:** Replace the tip.

**Problem 5. The Plugin LEDs flash and the buzzer sounds when my opponents guard is hit for the second time (box 5 in the Plugin Quickstart Guide).**

After the first guard hit the Plugin should be correctly calibration and all subsequent guard hits should not register.

**Solution 1:** Remove the Plugin from the epee and start again by pressing the switch.

**Problem 6. The Plugin buzzer does not sound when you hit your foot (box 6 in the Plugin Quickstart Guide).**

Although calibration may have been successful, subsequent hits are not being detected. This indicates there is no/poor connection between sockets 1 and 2 on the epee connector when the tip switch is pressed.

Using the CWF Advanced Epee Analyser or DMM, measure the resistance from the epee tip to socket 1 at the epee connector when the tip is fully pressed. Repeat for socket 2. Both readings should be below 2Ω. If one or both readings are above 2Ω, follow the instructions in the order given below until one solution works.

**Solution 1:** Check the two wires at the epee connector for breaks or loose terminal sockets.

**Solution 2:** After repeated insertions, the Plugin pins can wear causing poor contact between the Plugin pin and epee connector socket. Use the spare socket provided on the side of each CWES case to check each pin for wear. If the Plugin pin feels loose when inserted, it can be adjusted using a small flat bladed screwdriver. Each Plugin pin has four spring fingers running the length of the pin. Using a small flat bladed screwdriver, gently open the spring by a fraction of a millimetre.

**Solution 3:** After repeated insertions, the Plugin pins can break causing poor contact between the Plugin pin and epee connector socket. Visually check each pin for broken spring fingers, which run from the pin tip to the pin base. If any pins are broken replace them with with spares, which are provided in each set. Follow the Plugin pin replacement instructions in section 8.1.1 .

**Solution 4:** Replace the contact spring.

**Solution 5:** Check the wiring from inside the barrel to the connector sockets.

**Solution 6:** Replace the tip.

**Problem 7. The Plugin red or green LEDs illuminate and the buzzer sounds when I hit my opponents guard.**

Guard hits should not register if the Plugin and both fencers epees are fully working. If more than 1 in 20 guard hits register, then follow the instructions in the order given below until one solution works.

**Solution 1:** Ensure you are following the instructions in the Plugin Quickstart Guide. In particular, wait until the LEDs turn off before inserting the Plugin and do not touch the Plugin pins. Failure to do either of these can upset the Plugin calibration cycle, which is performed when the LEDs are on.

**Solution 2:** Check the handle is not loose on both epees. Any small movement of the handle can cause a poor connection (several 10s of ohms) between the epee handle, guard and Plugin.

**Solution 3:** Check the epee connector is not loose on both epees.

**Solution 4:** Check the two wires at the epee connector for breaks or loose terminal sockets for both epees.

**Problem 8. Hits to my opponents mask do not register.**

This may occur if you hit an electrically conductive part of the mask. This occurs when the paint/enamel covering the wire mesh gets chipped off to expose bare metal. There are currently no solutions to this problem. Future software updates may eliminate this problem.

## 9.2 Plugins with plastic epees

Please follow all the instructions in the Plugin Quickstart Guide before proceeding.

**Problem 1. The Plugin red LED flashes and the buzzer sounds when I press the switch (box 7 in the Plugin Quickstart Guide).**

The red LED indicates the battery is running low and that there is less than 3 hours use remaining. Please follow the battery charging instructions in section 6 .

**Problem 2. The Plugin LEDs do not flash and the buzzer does not sound when I press the switch (box 8 in the Plugin Quickstart Guide).**

This is due to the Plugin battery being completely empty. Please follow the battery charging instructions in section 6 .

**Problem 3. The Plugin LEDs do not flash and the buzzer does not sound when the tip is pressed (box 9 in the Plugin Quickstart Guide).**

Using the CWF Advanced Epee Analyser or DMM, measure the resistance between socket 1 and socket 2 at the epee connector when the tip is fully pressed. The reading should be below 2Ω. If the reading is above 2Ω, follow the instructions in the order given below until one solution works.

**Solution 1:** Check the two wires at the epee connector for breaks or loose terminal sockets.

**Solution 2:** Replace the tip.

**Solution 3:** Replace the blade wire by following the instructions in section 8.2.4 .